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Rurality, socio-economic disadvantage and educational mobility: A Scottish case study

Daniel Borbely[1] | Markus Gehrsitz[2,3] | Stuart McIntyre[2] | Gennaro Rossi[4] | Graeme Roy[5]

[1]Queen's Business School, Queen's University Belfast, Belfast, UK

[2]Department of Economics, Fraser of Allander Institute, University of Strathclyde, Glasgow, UK

[3]Institute for the Study of Labor (IZA), Bonn, Germany

[4]Department of Economics, University of Sheffield, Sheffield, UK

[5]College of Social Sciences, University of Glasgow, Glasgow, UK

Correspondence
Gennaro Rossi, Department of Economics, University of Sheffield, 9 Mappin Street, Sheffield S1 4DT, UK.
Email: g.rossi@sheffield.ac.uk

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Abstract

Rurality is known to be associated with a number of weaker educational outcomes, from lower attainment through to lower social mobility. This is why so much policy and practitioner focus has been directed at addressing the rurality gap in educational outcomes. In this paper, we use pupil-level data for Scotland to contribute to two dimensions of this problem. First, we explore the relationship between socio-economic deprivation and educational mobility across urban and rural primary schools in Scotland. This provides new insights on the issue of rural disadvantage. Second, we use our dataset to explore the socio-economic makeup of urban and rural schools in Scotland, documenting that schools located in the highest and lowest SIMD areas are more homogeneous than those in the middle. This is important for the classification of schools in targeting educational interventions to improve social mobility.

KEYWORDS

educational mobility, primary education, rurality, socio-economic disadvantage

INTRODUCTION

There is a long-established link between poverty, deprivation and low educational attainment (see Robertson & McHardy, 2021 for a review). This has generated various responses from policymakers over time. For instance, the Widening Participation in Higher Education in England (Department for Education, 2020), or the Scottish Attainment Challenge, which

Key insights

What is the main issue that the paper addresses?

There has been considerable focus on closing the educational attainment gap in recent years. Policies targeting socio-economically disadvantaged pupils are based on indicators of poverty which often do not include rural areas. This paper examines the gap in educational mobility between rural and urban schools in Scotland.

What are the main insights that the paper provides?

Rural schools are characterised by lower educational mobility (i.e., the fraction of pupils eligible for free school meals and who perform well in school), relative to urban schools. Furthermore, rural schools are on average less 'deprived' according to most domains of deprivation, such as income, crime or health.

'aims to raise the attainment of children and young people living in deprived areas, in order to close the equity gap' (Scottish Government, 2021a). Despite this policy and academic focus, less is known about the link between rurality and academic attainment. Whilst rurality has been shown to be associated with a number of detrimental educational outcomes, from lower attainment through to lower mobility to further and higher education (Davies et al., 2021; Echazarra & Radinger, 2019; Lasselle & Johnson, 2021), evidence on primary education remains limited.

This paper contributes to this literature by exploring the attainment achieved by primary schools across a measure of socio-economic disadvantage according to whether the school is in an urban or rural setting. We use pupil-level data to construct a measure of educational attainment at the school level and consider this alongside free school meal (FSM) registration rates in that school. As FSM policies are normally designed to support children from low-income households, FSM registration is one of the main measures of socio-economic deprivation that is used in practice in educational policy in Scotland.[i] Our work carries some unique contributions. First, unlike most of the literature simply focusing on educational attainment, we focus on 'educational mobility', in other words how well students from low socio-economic backgrounds perform at school. A similar approach was taken by Blanden et al. (2007) and Jerrim and Macmillan (2015).

We explore whether there is any difference in the relationship between socio-economic background and educational attainment in primary schools in urban and rural settings. This is motivated by the vast literature linking poverty or deprivation to low educational attainment (Robertson & McHardy, 2021), as well as the longstanding focus of the Scottish Government on the persistent attainment gap.[ii] In doing so, we show that there is a clear difference in the educational mobility rates of pupils in urban and rural schools in Scotland. Our approach closely follows that of Chetty et al. (2020), who examine income segregation across US colleges by calculating income mobility rates for each college.[iii] Echazarra and Radinger (2019) argue that most of the rural–urban attainment gap observed today is driven by socio-economic differences. The advantage of using educational mobility, as opposed to attainment, is that we can try to shed light on what is preventing low-income pupils in rural schools from thriving. As argued by Gazeley (2022), rural schools normally have a lower fraction of pupils on FSM, therefore they tend not to be targeted by 'disadvantage' policies. However, these schools also experience wider attainment gaps *within* the school. Second, despite the large amount of attention that the rural–urban attainment gap receives in terms of higher education (HE) access, evidence on primary schools remains scarce, despite the plethora of evidence on the importance of early years development (see, e.g., Cunha et al., 2006).

Addressing these challenges of rural disadvantage requires accessible measures of school socio-economic (dis)advantage that accurately capture different dimensions of disadvantage in a rural and urban context alike. In a recent paper, Lasselle and Johnson (2021) set out several difficulties with the existing approach adopted to define disadvantage for the purposes of policy interventions, like the widening access and attainment challenge initiatives, for schools in remote and rural Scotland. At present, common indicators for targeting policy initiatives at deprived schools (e.g., the Scottish Attainment Challenge) include those in the bottom quintile of the Scottish Index of Multiple Deprivation (SIMD) and the fraction of school pupils eligible for FSM.[iv] However, as Lasselle and Johnson (2021) argue, there are several reasons why these metrics may fail to capture the dimensions of deprivation in remote and rural Scotland. In the 2020 SIMD for instance, there are no parts of Orkney, Shetland or the Western Isles in the bottom SIMD quintile (see the section entitled 'Institutional Background' below for more details).

Instead, Lasselle and Johnson (2021) argue for three other metrics to be added to the list of measures used to determine disadvantage: the second SIMD quintile, the progression rate of pupils to HE in each school and a 'remote' or 'rural' indicator. They then build these measures into a basket where the school is flagged if it meets at least one criterion in each category. The first category is based on whether the school is above average in terms of the fraction of pupils from the bottom two SIMD quintiles. The second category is based on whether it is below the national average in terms of progression to HE or above the national average in terms of FSM registrations. Finally, the third category refers to the sixfold urban/rural classification of the Scottish Government (i.e., accessible rural area or small town, remote rural area or small town, large urban area and other urban area).

One limitation of their approach, however, was that by focusing on schools with an 'above average' number of pupils from the most deprived SIMD deciles, they were not able to differentially weight schools with 55% vs 25% of their pupils from the first SIMD quintile. This was an admitted weakness in Lasselle and Johnson (2021) and raises an interesting question: How heterogeneous are schools in Scotland based on the SIMD ranking of their pupils? And how does this compare to the SIMD ranking of the school itself? If the intake of pupils to the most deprived schools is predominantly from the most deprived neighbourhoods, this suggests that we should not be too concerned about the measure that Lasselle and Johnson (2021) utilise.

Therefore, the third contribution of this paper is to present evidence on this point. We show that the schools in the most and least deprived areas of Scotland based on SIMD are more homogeneous in the socio-economic classification of their intake than schools in the middle of the SIMD distribution. This suggests that using the approach advocated by Lasselle and Johnson (2021) is likely to capture this dimension of disadvantage relatively well. However, unlike Lasselle and Johnson (2021), we also explore the seven domain rankings[v] of the SIMD index and enrich the previous findings with two additional insights: (i) rural schools have more homogeneous intakes than urban schools; (ii) rural schools are on average less 'deprived' according to most of the SIMD domains.

The rest of this paper is structured as follows. In the next section, we review the existing literature in this area. In the third section, we outline the institutional context of this study. In the fourth section, we set out the data that we use and the approach that we take to calculate our measure of educational mobility. The fifth section presents our results, while the sixth section discusses the implications of these findings. The final section concludes.

LITERATURE REVIEW

Robertson and McHardy (2021) provide an insightful review of the extensive literature on the link between poverty, deprivation and academic attainment. The authors identify a strand of the literature focusing on factors operating at the meso-level (i.e., families, schools and communities). Children living in poverty are more likely to experience health issues, with consequent effects on their social, emotional and cognitive development, behavioural and educational outcomes (NHS Scotland, 2018). Equally, poor households are more likely to live in deprived areas with limited access to a set of amenities, including high-performing schools (Burgess et al., 2019). There has been a considerable focus on the geographic determinants of attainment. For instance, proximity to HE institutions plays an important role in the decision to attend university (see, e.g., Card, 1993; Dickerson & McIntosh, 2013; Gibbons & Vignoles, 2012; Mangan et al., 2010).

Another body of evidence finds that pupils from disadvantaged neighbourhoods experience worse school outcomes and social mobility (Chetty et al., 2014; Cutler & Glaeser, 1997; Gibson & Asthana, 1998; Sammons et al., 2015) and moving to lower-poverty areas improves the chances of HE attendance, especially if the move happens early on in life (Chetty et al., 2016). In addition, parents can mitigate peers' and communities' influence (Agostinelli et al., 2020; Norris, 2020). Poverty, however, is not the only environmental feature affecting educational gains. Rurality, for instance, is linked to a number of weaker educational outcomes, from lower attainment (Welch et al., 2007) through to lower mobility and lower post-school education (Davies et al., 2021; Echazarra & Radinger, 2019; Lasselle & Johnson, 2021; Ulubaşoğlu & Cardak, 2007; Van Maarsaveen, 2020).

Meanwhile, since the 1997 Dearing Report (Dearing, 1997) on the widening access agenda, a substantial literature has explored the determinants of access to HE. For instance, a sizeable literature focuses on factors such as socio-economic status (SES), gender and ethnicity (Ball, Davies, et al., 2002; Ball, Reay, et al., 2002; Chowdry et al., 2013; Ilie et al., 2021; Reay et al., 2005). Further work explores the role of place in accessing HE. Davies et al. (2021), for example, use data on university students to explore the role of place in progression to ‘elite’ universities in the United Kingdom. They show that based on raw progression rates to ‘elite’ universities, there appears to be a rural *advantage* dimension. However, when what they call ‘a vortex of influences’ (Davies et al., 2021) is accounted for (including socio-economic disadvantage), a distinct *urban* advantage emerges. This underlines the need to consider attainment and socio-economic disadvantage together.

Similarly, Echazarra and Radinger (2019) use data from the OECD Programme for International Student Assessment (PISA) 2015 alongside the Teaching and Learning International Survey (TALIS) 2013. They find that rural–urban gaps are mostly driven by socio-economic background and diverging expectations towards HE completion. In addition, the difference in expectations, aside from the attainment gap itself, persists even after accounting for SES. In other words, given two pupils with similar characteristics (i.e., gender, family income, etc.), we could expect the one from a rural area to be less inclined to complete HE. Van Maarsaveen (2020) offers similar insights on how living in more densely populated areas significantly raises the odds of attending university and also provides explanations for some potential mechanisms.

Despite the large emphasis put on the urban–rural disadvantage for HE access, there is still a paucity of evidence on the intersection between socio-economic disadvantage, rurality and educational attainment in primary schools, with most works focusing on developing countries (see, e.g., Bagley & Hillyard, 2014; Brown & Park, 2002; Chudgar & Quin, 2012; Lounkaew, 2013). Socio-economic disadvantage experienced in the early years can strongly affect cognitive and non-cognitive development (Cunha et al., 2006), and thus early years educational outcomes, with knock-on effects on HE access (Chetty et al., 2011), especially in a context such as the United Kingdom (Anders, 2012; Chowdry et al., 2013; Crawford et al., 2017). However, SES persistently influences educational attainment throughout children's lives, even conditional on initially high gains (Crawford et al., 2017; Ilie et al., 2021).

INSTITUTIONAL BACKGROUND

Scotland is one of the constituent nations of the United Kingdom, with a population of approximately 5.3 million people (Scottish Government, 2011). The Scottish Government employs a sixfold 'areas classification', based on population size and distance to nearest settlement: large urban areas; other urban areas; accessible small towns; remote small towns; accessible rural areas; and remote rural areas. A detailed description of this classification is presented in Appendix B. About 98% of the country's land area is rural (accessible or remote), with nearly 20% of the population living in these areas. As we can see from the left panel of Figure 1, the nation is characterised by a large variation in population density, with the Central Belt (right panel) being the most densely populated and urbanised, while the north and south are more rural).[vi]

Scotland is split into 6976 'data zones', each containing between 500 and 1000 residents. Figure A.1 in the Appendix shows an example of data zones for the Central Belt (left panel) and Glasgow City (right panel). Each data zone is ranked from most deprived (1) to least deprived (6976) based on the SIMD. The SIMD summarises information across seven domains of deprivation (i.e., income, employment, crime, education, health, housing and access to services). Table B.1 provides information on the variables used to build the index. In school year 2021/22, about 20% of the entire Scottish school population resided in rural areas (Scottish Government, 2021c). Pupils in Scotland typically start school in August of the year in which they turn five. They attend primary school from first grade (P1) to seventh grade (P7), before transferring to secondary school. As a result of the introduction of the Curriculum for Excellence, primary school students are assessed in reading, writing, listening and talking, and numeracy in Grades 1, 4 and 7. These assessments, which are teacher based, rather than standardised and blindly marked, are meant to establish whether a pupil

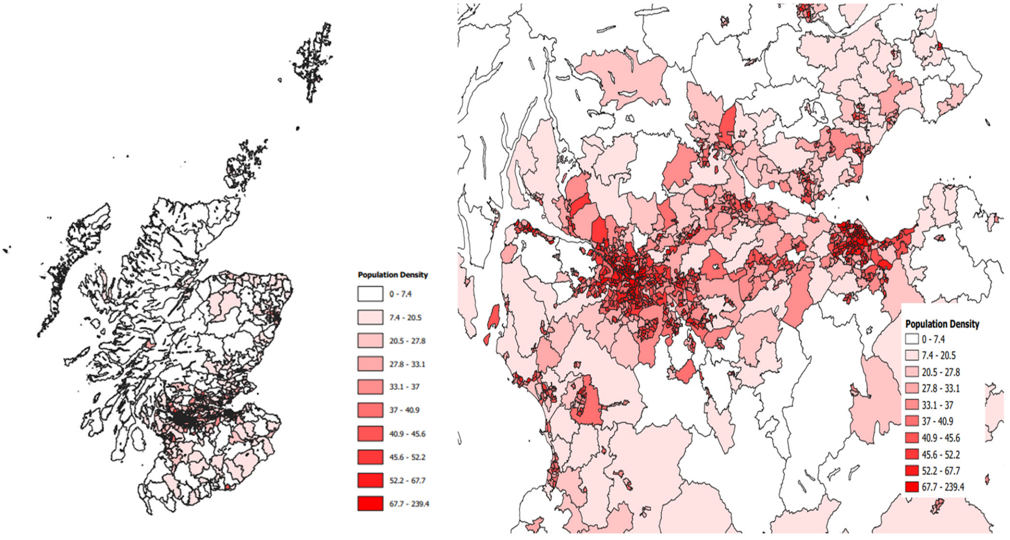

FIGURE 1 Scotland's population density. [Colour figure can be viewed at wileyonlinelibrary.com]

is performing at the level expected for that grade. We use the words 'grade' and 'stage' interchangeably.

For most pupils in Scotland, FSM eligibility is means tested. Typically, eligible children are those whose parents or carers receive either of the following: (a) Income Support, Income-based Job Seekers Allowance or any income-related element of Employment and Support Allowance; (b) support under Part VI of the Immigration and Asylum Act 1999; (c) Child Tax Credit, do not receive Working Tax Credit and had an annual income below an annually assessed threshold; (d) both Child Tax Credit and Working Tax Credit; (e) Universal Credit. In January 2015, all pupils in Grades 1, 2 and 3 of primary school (P1, P2 and P3) became automatically eligible to receive FSM, regardless of their financial circumstances.

In this paper we use FSM registration as our main proxy for SES. This approach has received some criticism. As FSM eligibility is linked to employment status, it might fail to capture the many (perhaps more persistent) facets of socio-economic disadvantage. For instance, it fails to identify children living in 'working poor' households or whose parents have low-status occupations or are working part-time (Hobbs & Vignoles, 2010; Ilie et al., 2017; Kounali et al., 2008). This issue might be exacerbated in rural areas for a number of reasons. First, the cost of living in remote areas is on average higher than in cities (Scottish Government, 2021d), therefore some non-FSM-eligible households might still be poorer than their urban counterparts in real terms. Second, FSM uptake in rural areas is traditionally lower, which might reflect a higher fear of stigma in smaller communities (Lasselle & Johnson, 2021). Third, lack of services (such as catering) in rural areas might shrink the supply of FSM.

MATERIALS AND METHODS

Our main data source for this analysis comes from the Scottish Pupils Census for all primary schools in Scotland between 2015 and 2018. We only included schools that are observable every year in the above-mentioned interval, and which had no 'missing' stages (i.e., an enrolment count of zero for any of the stages from P1 to P7). The census includes all—approximately 390,000—pupils enrolled in Local Authority (LA)-funded primary schools, and for each of them we observe their gender, ethnicity, stage, an identifier for the school they are enrolled in and, most importantly for this analysis, whether they are registered for FSM.

We then match these data, using an anonymised candidate number, to Curriculum for Excellence teacher-based assessments in literacy and numeracy, as well as literacy sub-categories such as reading, writing, listening and talking, for pupils in P1, P4 and P7. Therefore, for each pupil, in each school, we observe the above-mentioned demographic features, alongside whether they performed at/above the expected level for the relevant primary school stage they are in. Ultimately, we obtain the following information pooled across school years 2015/16–2018/19 at the stage and school level: (i) the percentage of pupils registered for FSM; (ii) the percentage of pupils who performed at/above the level in both literacy and numeracy.

There are two ways in which we could use these data: (i) to explore FSM eligibility against the proportion of pupils in each school performing at or above the level; (ii) to examine FSM eligibility against educational mobility, defined as the proportion of pupils on FSM performing at or above the level. The former is simpler, but it does not consider the compositional effect within the school. Using this second approach is preferable because this measure at least partially considers that pupils from high-SES backgrounds are often attending schools where a large fraction of pupils perform at the level. In other words, conditioning on FSM status helps account for pupil (self-)selection.

This measure can be summarised by a standard formula for conditional probability, as illustrated below:

$$P(\text{At level} \mid \text{FSM}) = \frac{P(\text{At level \& FSM})}{P(\text{FSM})} \quad (1)$$

This formula represents the probability that a randomly drawn pupil from a certain population, whether stage/school/LA, performed at/above the level in literacy and numeracy, given that this same pupil is FSM registered (we also refer to this as the 'success rate'). In other words, if our reference population is school *A* in LA *X*, then the above formula helps answer the following question: By picking a student at random within this school/LA, knowing that he/she is FSM registered, what is the probability that he/she has also performed at/above the level in that specific year? Given that FSM registration and whether or not the student performs at the level are not two mutually exclusive events, the above-mentioned conditional probability can be illustrated as

$$P(\text{At level \& FSM}) = \frac{\text{No. pupils who performed at level \& FSM}}{\text{Total no. pupils in school}} \quad (2)$$

Namely, the share of pupils in school *A* who are FSM-registered pupils AND performing at/above the level, also referred to as the 'mobility rate':

$$P(\text{FSM}) = \frac{\text{No. pupils on FSM}}{\text{Total no. pupils in school}} \quad (3)$$

This is simply the share of pupils in school who are FSM registered (access). It is easy to work out from that the ratio between these two elements:

$$P(\text{At level} \mid \text{FSM}) = \frac{\text{No. pupils who performed at level \& FSM}}{\text{No. pupils on FSM}} \quad (4)$$

Namely, the share of FSM-registered pupils in school *A*, who have also performed at/above the level. By rearranging Equation (1), it is easy to see how the mobility rate is just the product of the access and success rate:

$$\underbrace{P(\text{At level \& FSM})}_{\text{Mobility rate}} = \underbrace{P(\text{FSM})}_{\text{Access}} \times \underbrace{P(\text{At level} \mid \text{FSM})}_{\text{Success rate}} \quad (5)$$

Therefore, the same level of mobility (in our example above, the median level) can be achieved with different combinations of access and success rate. For example, a school which has 60% of pupils registered for FSM, and 40% of these pupils performed at the level ($0.6 \times 0.4 = 0.24$, hence 24%) will be just as 'mobile' as a school in which 30% of its 80% of FSM-registered pupils have also performed at the level ($0.8 \times 0.3 = 0.24$, hence 24%).

Having calculated this measure, we use it to explore the relationship between socio-economic deprivation and educational mobility across urban and rural primary schools in Scotland. Specifically, we plot these data separately for urban and rural schools in Scotland, with each dot representing a school stage. By fitting an isoquant to the data for urban and rural schools, we can see not only the pattern between mobility and deprivation for each school stage, but also how these differ across urban and rural schools. Here we use the six-category classification made by the Scottish Government and re-categorise it as follows:

urban = large and other urban; rural = accessible and remote rural plus small towns, whether accessible or remote.

RESULTS

This results section is structured in two parts. In the first part, we present results on the relationship between educational attainment and mobility, as well as socio-economic deprivation, while in the second part we explore how heterogeneous primary schools are in their socio-economic makeup.

Rural disadvantage in educational mobility

Before focusing our analysis on urban and rural schools, we start by introducing our general approach to examining educational mobility by considering this across three school stages, P1, P4 and P7, corresponding to the stages at which attainment evaluations take place.[vii] This is presented in Figure 2. On the horizontal axis, we measure the percentage of pupils registered for FSM within a specific school stage (access), whereas on the vertical axis we report the percentage of pupils on FSM who performed at the level (success rate). By multiplying these two measures, we obtain the mobility rate, or simply put, the percentage of all pupils in a specific stage school who are registered for FSM and performed at or above the expected level. The difference between the mobility rate and the success rate is that the former refers to all the pupils in a school stage, whereas the latter refers only to those in the school stage who receive FSM.

If a school stage has a high percentage of pupils on FSM (moving to the right on the horizontal axis) and a high percentage of pupils on FSM who performed at the level (moving upward on the vertical axis), this school has a high mobility rate. Therefore, as we move from the bottom left to the top right of the figure, we go from low-mobility to high-mobility school stages. The same level of mobility can be achieved with different combinations of

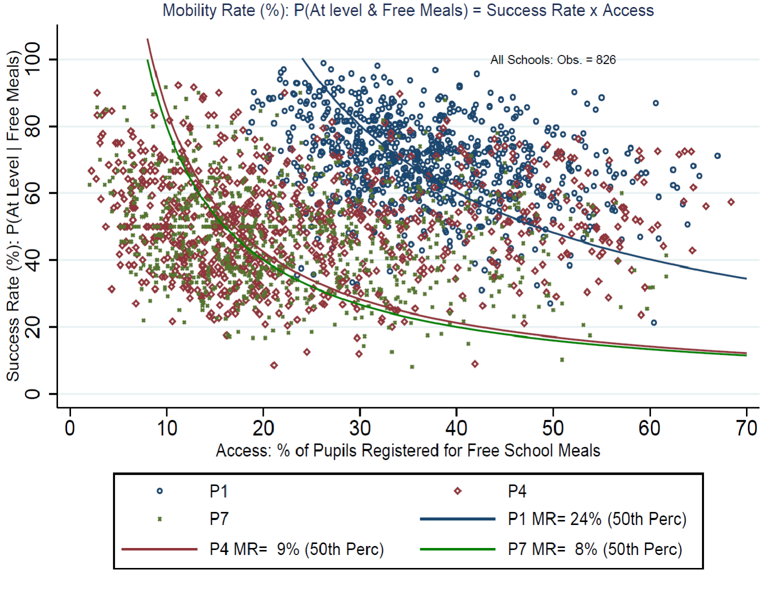

FIGURE 2 Mobility rates by stage—all schools. [Colour figure can be viewed at wileyonlinelibrary.com]

access and success rates. This is the idea underpinning the three downward-sloping curves presented in the figure.

Let us focus on the dark blue curve. Along this curve are located all the schools in the sample whose P1 cohorts recorded a mobility rate of 24%, namely 24% of students are FSM registered and performed at/above the level. This value corresponds to the 50th percentile, or median value, within P1 school cohorts. What this means is that 50% of P1 school cohorts have a mobility rate of 24% or more, and 50% of P1 school cohorts have a mobility rate below 24%. By focusing on the top end of this curve we can see that there are P1 school cohorts whose percentage of FSM-registered pupils is just below 30%, and nearly 90% of these performed at/above the level. Likewise, P1 school cohorts whose percentage of FSM-registered pupils is around 50%, and nearly half of which performed at/above the level, recorded the same ($0.5 \times 0.48 = 24\%$) mobility rate. A similar rationale applies to the dark red and green lines, which represent the median mobility rates among P4 and P7 school cohorts, respectively.

What emerges from this figure is that P1 school cohorts seem to be characterised by a mobility rate that is larger (by a factor of 3, approximately) than those of their P4 and P7 counterparts. The reason for this is twofold: (i) the share of pupils performing at the level is much larger among P1 than it is for P4 and P7 cohorts; (ii) as a result of the extension of FSM eligibility to all P1–P3 pupils from 2015, regardless of their household income, there are many more FSM-registered pupils among P1 than P4 and P7 cohorts. In other words, if both these measures are larger, there will be a higher chance that a randomly picked pupil from a P1 cohort will be FSM registered and perform at/above the level compared to one from a P4/P7 cohort.

One aspect to be noted is the 'small' number of schools present in this sample (826 against around 2000 in total). This is the result of statistical disclosure control measures (i.e., some school stages had a count of students on FSM—or on FSM and performing at the level—below five, leading these schools to be omitted from the sample to prevent identification). The reduced number of observations due to statistical disclosure control means that we pursue a different strategy when splitting out schools by urban and rural, namely pooling together P4 and P7 cohorts and omitting P1 ones. Hence, not only are we able to present larger counts (by summing the number of pupils in P4 and P7), therefore not needing to omit a large number of schools, but we are also able to use FSM registration as a more representative measure of SES (FSM registration being linked directly to income in these school stages).

Instead of distinguishing school stages, we now separate schools in urban areas from those in rural areas. In Figure 3, access measures the percentage of P4 and P7 pupils who are FSM registered, whereas the success rate is the share of those who also performed at/above the level. Each dot represents an entire school. The figure shows that the 197 rural/small-town schools present in this sample[viii] are characterised by a smaller median level of mobility (5%) than their urban counterparts (7%). This means that among rural and small-town schools in this sample, the portion of P4 and P7 pupils who are FSM registered and performed at/above the level in literacy and numeracy is slightly smaller than in urban schools. The question arises whether this is a result of there being a smaller number of FSM-registered pupils in rural schools in the first place. However, the same pattern is evident if we only look at larger schools (defined as those where the school enrolment count is above the 25th percentile), see Figure 4.

Now we shed light on the rural–urban gap by using a regression-based approach. First, this allows us to account for other school characteristics which might: (i) vary systematically across areas; (ii) predict mobility. Second, as regression outputs are less disclosive, we can use the entire sample. We estimate

$$P(\text{At level \&FSM})_{g(s)t} = \beta_0 + \beta_1 \text{Rural}_s + \beta_2 \text{Small town}_s + \gamma X_{g(s)t} + \lambda_t + \varepsilon_{g(s)t} \qquad (6)$$

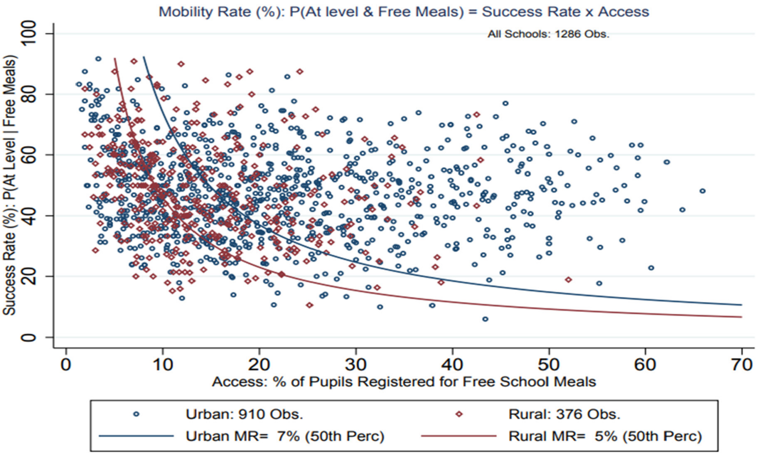

FIGURE 3 Mobility rates by urban/rural schools. [Colour figure can be viewed at wileyonlinelibrary.com]

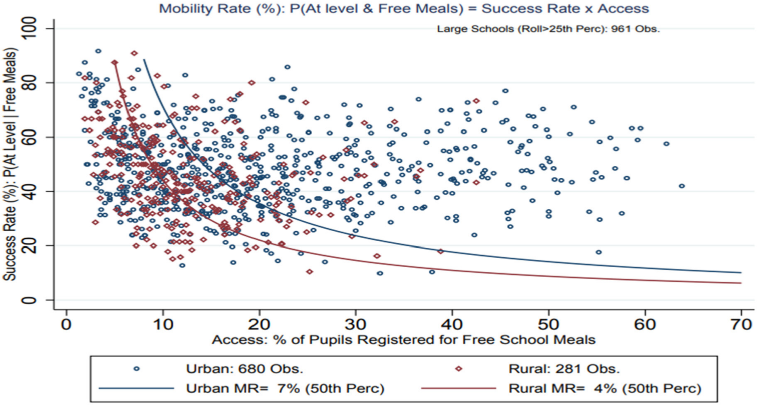

FIGURE 4 Mobility rates by urban/rural schools—larger schools only. [Colour figure can be viewed at wileyonlinelibrary.com]

where $P(\text{At level \&FSM})_{g(s)t}$ is the mobility rate for grade g in school s in school year t. Rural_s and Small town_s are two binary variables for rural and small-town schools, respectively. $X_{g(s)t}$ is a set of time-varying, school-level information as well as an indicator for Grade 7. Finally, λ_t accounts for year fixed effects. To account for within-school correlation of the error term, we use cluster-robust standard errors at the school level. We want to estimate β_1 and β_2, namely the rural and small-town mobility gaps, relative to urban schools. Whilst including school fixed effects would control for differences in school-specific, time-invariant levels of mobility, it would also leverage within-school variation. Hence, we would not be able to estimate β_1 and β_2, as school location is fixed over time. Table 1 reports estimates for the model in Equation (6).

Table 1 uses data from P4 and P7 cohorts only, for about 1793 schools over four school years (14,344 observations). Column (1) reports estimates without control variables. Taken at face value, these suggest that rural and small-town schools are characterised by about 5.7 and 3.9 percentage points less mobility relative to those in urban schools. The gaps increase after controlling for school population, pupil–teacher ratio and stage, even more so for rural schools. In addition, Grade 7 is characterised by 1.1 percentage points lower mobility than Grade 4, and both larger and understaffed schools present slightly lower mobility rates, all else equal.

TABLE 1 Mobility gap rural–urban schools.

Variable	(1)	(2)	(3)	(3)	(4)
	P (At level & FSM)				
Rural area	−0.057***	−0.057***	−0.072***	−0.072***	−0.072***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Small town	−0.039***	−0.039***	−0.041***	−0.041***	−0.041***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Grade = 7		−0.011***			−0.011***
		(0.001)			(0.001)
No. pupils			−0.000***		0.000
			(0.000)		(0.000)
Pupil–teacher ratio				−0.005***	−0.005***
				(0.000)	(0.001)
Observations	14,344	14,344	14,344	14,344	14,344
No. schools	1793	1793	1793	1793	1793
Mean	0.07	0.07	0.07	0.07	0.07
SD	0.10	0.10	0.10	0.10	0.10
Year FE	Yes	Yes	Yes	Yes	Yes
School FE	No	No	No	No	No
Adjusted R-squared	0.0786	0.0814	0.0848	0.102	0.105

Note: Robust standard errors in parentheses.
**p* < 0.1; ***p* < 0.05; ****p* < 0.01.

Another aspect to consider is whether accessibility accounts for some of these differences. In Table 2 we repeat the same exercise as in Table 1, but we break down Rural_s and Small town_s based on whether they are accessible or not. Again, urban areas constitute our reference group.

Table 2 suggests that remoteness plays a crucial role in explaining the rural–urban gap. Specifically, schools in remote rural areas experience a gap in mobility between 6.1 and 8 percentage points less than urban areas, which is about 1–2 percentage points larger (in absolute value) than when we pool accessible and rural areas together.

Socio-economic diversity of primary schools in Scotland

In this section, we provide some insights into how heterogeneous schools are in terms of their intake. In the Scottish primary school system, school populations are largely defined by their catchment areas, with relatively few pupils attending a school different from the designated one (this occurs via the use of a 'placing request' submitted by the parents).

Figure 5 shows that nearly 30% of Scottish primary school catchment areas stretch across seven or more data zones. This might suggest a high degree of heterogeneity in school intakes. However, we need to look closer at how heterogeneous these data zones are in their characteristics. To do this, we will make use of the SIMD.[ix]

Our starting point in understanding how heterogeneous school intakes are is to examine how many different deciles are represented in each school. Figure 6 provides this information. It is notable that a significant share of schools (at least 24%) 'contain' five or more

TABLE 2 Mobility gap rural–urban schools (remote and accessible).

Variable	(1)	(2)	(3)	(4)	(5)
	P (At level & FSM)				
Accessible rural area	−0.055***	−0.055***	−0.069***	−0.068***	−0.068***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Remote rural area	−0.061***	−0.061***	−0.077***	−0.080***	−0.080***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Remote small town	−0.050***	−0.050***	−0.052***	−0.053***	−0.053***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Accessible small town	−0.034***	−0.034***	−0.037***	−0.037***	−0.037***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Grade = 7		−0.011***			−0.011***
		(0.001)			(0.001)
No. pupils			−0.000***		0.000
			(0.000)		(0.000)
Pupil–teacher ratio				−0.005***	−0.005***
				(0.000)	(0.001)
Observations	14,344	14,344	14,344	14,344	14,344
No. schools	1793	1793	1793	1793	1793
Mean	0.07	0.07	0.07	0.07	0.07
SD	0.10	0.10	0.10	0.10	0.10
Year FE	Yes	Yes	Yes	Yes	Yes
School FE	No	No	No	No	No
Adjusted R-squared	0.0793	0.0821	0.0858	0.103	0.106

Note: Robust standard errors in parentheses.
*$p<0.1$; **$p<0.05$; ***$p<0.01$.

SIMD deciles, with few containing only one or two. Another question that arises is: How well does the physical location of a school predict its composition? Figure 7 classifies groups of schools based on the deprivation decile of the data zone the school is located in (horizontal axis), with respect to the (weighted) average of its composition (vertical axis). The size of each circle/diamond represents the number of schools represented by that specific point (the minimum cell size here is 10). For example, schools whose location is in the first decile of deprivation mostly gather pupils coming from the first and second deciles. Schools located in 'central' deciles, namely around a median level of deprivation, seem to be more heterogeneous than schools located at the two ends of the deprivation distribution.

In addition, rural schools (blue circles) appear to be mostly located between the third and seventh deciles, but they also seem to have a less heterogeneous composition. In other words, unlike urban schools, their average intake seems to mirror their geographic location. Whilst this may be because catchment areas are larger in rural areas, with some schools' data zones covering the entirety of the catchment area, this remains an important outcome in the process that policymakers need to consider, as it suggests that rural schools experience less deprivation and have more homogeneous pupil intakes than urban schools. This is because in rural areas, due to low population density, catchment areas almost fully overlap with data zones, and they are both larger than in urban areas.

In Figure 8 we look at the different components of deprivation.[x] Once again, we observe a very similar pattern as in Figure 7, with rural schools ranking fairly high in most SIMD domains. For instance, most rural schools are located in areas with little income or employment deprivation and lower crime rates, as well as higher levels of education, and better health and housing conditions. However, almost all of these schools are in areas with limited access to services. This domain is measured as the average drive or public transport time to a series of services such as GP surgeries, post offices, retailers and, indeed, schools.

DISCUSSION

Closing the poverty-related attainment gap has become a common priority for policymakers in many countries. In Scotland, for example, the Scottish Government committed in its 2016 Programme for Government to ‘substantially eliminate [the attainment gap] within a decade’ (Scottish Government, 2016: 14). But actually closing the attainment gap has remained elusive. There are also fears that the COVID pandemic, and the disruption to pupil engagement with their learning, may amplify this gap in the long run. The opportunities that pupils from more privileged backgrounds had to access support during lockdown (Children's Commissioner, 2020; Edge, 2020) may have added to this gap. And rural areas, perhaps as a result of the digital divide in access to broadband, may be particularly exposed to such impacts (Glass et al., 2021).

Designing effective policy to close the poverty-related attainment gap therefore faces a number of difficulties—and must confront the existing pattern of attainment across the country. A key dimension of this is the rural attainment gap. Our results support those of other authors—such as Lasselle and Johnson (2021)—in demonstrating a pattern of lower attainment and educational mobility among pupils at rural schools compared to urban schools across measures of socio-economic deprivation. Consequently, a spatially blind policy fails to acknowledge the large numbers of children who grow up in rural circumstances and the potential additional barriers they may face. Specific drivers of that rural–urban attainment gap extend from issues around sparsity of population, remoteness, teacher shortages, mixed-years groups and other factors. Whilst it is important to unpick the causes of such a finding, our results have important cross-cutting implications for current academic and policy debates.

First, our findings demonstrate the importance of appropriate policy actions to address education disadvantage in rural areas in their own right. This is not to argue against support to erode the income-related attainment gap, which remains the headline priority, but simply to argue that policy needs to go beyond relying solely upon uniform national measures of deprivation—such as poverty—across urban and rural areas. Such mechanisms will not capture nor correct for barriers faced in rural communities. Whilst closing the poverty-related attainment gap is crucial, recognition of the distinct challenges of rural areas is needed if the overall attainment gap is to be closed. Solutions could, for example, include a ‘remote’ or ‘rural’ indicator in education support packages, with the aim of providing additional funds to be used at a local level to capture the distinct consequences of a rural situation.

That said, policy responses are likely to need to go beyond this, including examining how teaching and learning practices may differ—or could differ—across urban and rural areas, through to broader issues around lower rates of mental wellbeing among young people living in rural areas (Rural Covid Life Survey, 2021). This would contrast with existing policy responses, such as the Scottish Attainment Challenge, which typically focus on the SIMD and the fraction of school pupils eligible for FSM. Our results indicate that rural schools are more homogeneous in their intake in terms of SIMD ranking than urban schools, but also present a distinct rural attainment gap.

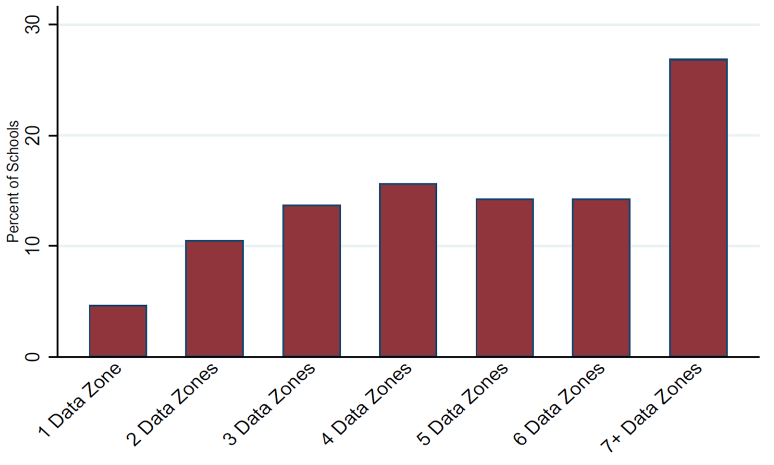

FIGURE 5 School composition—data zones. [Colour figure can be viewed at wileyonlinelibrary.com]

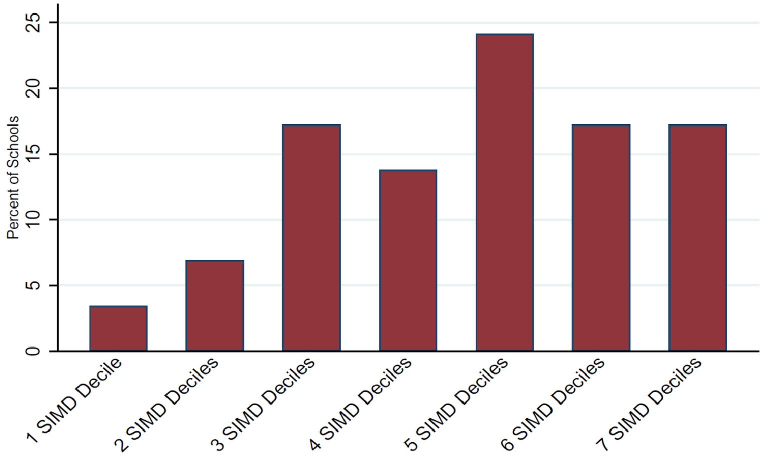

FIGURE 6 School composition—SIMD deciles. [Colour figure can be viewed at wileyonlinelibrary.com]

Second, by using all seven domains of the SIMD, our finding that access to services (rather than income or unemployment, for example) is a key varying factor between urban and rural areas suggests that it is the very nature of rurality that is crucial. This again provides evidence of the need for targeted rural responses over and above national policy agendas. The variability within rural communities points to the importance of local variations and bespoke rural solutions being needed. This, in addition to informing debates over resourcing, also offers insights over administration and decision-making for attainment support in rural communities and education environments.

CONCLUSION

A substantial literature has looked at the relationships between poverty and deprivation and low educational attainment (see Robertson & McHardy, 2021). Similarly, the relationship between rurality and weaker educational outcomes has been the subject of extensive study (Davies et al., 2021; Echazarra & Radinger, 2019; Lasselle & Johnson, 2021). Given the

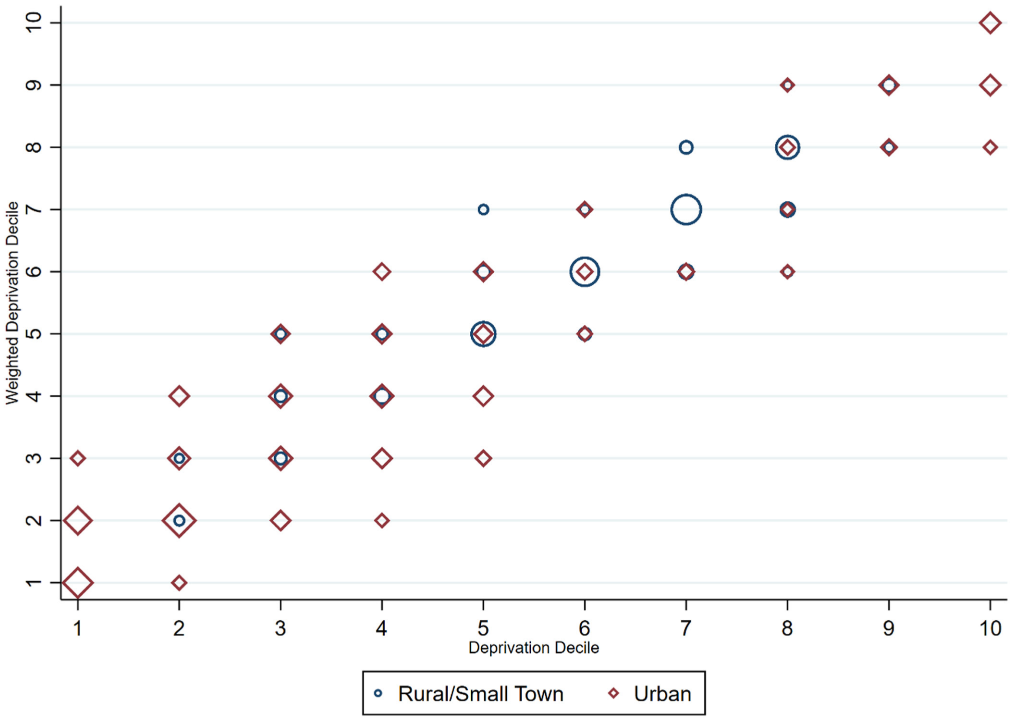

FIGURE 7 School composition—SIMD deciles by urban/rural. [Colour figure can be viewed at wileyonlinelibrary.com]

continuing focus of education policy on addressing these issues, this paper addressed two key issues in the understudied case of primary schools.

First, we explored the attainment achieved by schools across a measure of socio-economic disadvantage, according to whether the school is in an urban or rural setting. Using pupil-level data on educational attainment, we constructed a measure of educational attainment at the school level and considered this alongside FSM uptake rates in that school. We showed that there is a clear difference in the educational mobility rates of pupils in urban and rural schools in Scotland. Furthermore, we showed that this was not driven by the presence of small primary schools in rural communities. This is the first contribution of our paper. Unlike most of the previous work focusing on raw attainment, this work focuses on educational mobility to identify the rural–urban gap. By using mobility, not only do we control for SES, but we also provide a different picture of the rural–urban attainment gap (i.e., the extent to which pupils from low-SES backgrounds do well in school).

Second, it is clear that having a measure of school socio-economic disadvantage that accurately captures different dimensions of disadvantage in a rural and urban context alike is key to targeting funding and interventions to address these challenges of rural disadvantage. Our analysis showed that one potential limitation of a recently developed approach to classify schools based on their level of deprivation, and which overcomes problems in characterising socio-economic deprivation in rural schools, is unlikely to be a substantial problem. Lasselle and Johnson's (2021) approach did not differentiate between schools based on how far above average their intake from low-SIMD neighbourhoods was, simply that the school had an above-average intake from the bottom SIMD quintiles.

If the intake of pupils to the most deprived schools is predominantly from the most deprived neighbourhoods, this suggests that we should not be too concerned about the measure that Lasselle and Johnson (2021) utilise. We showed that schools in the most and least

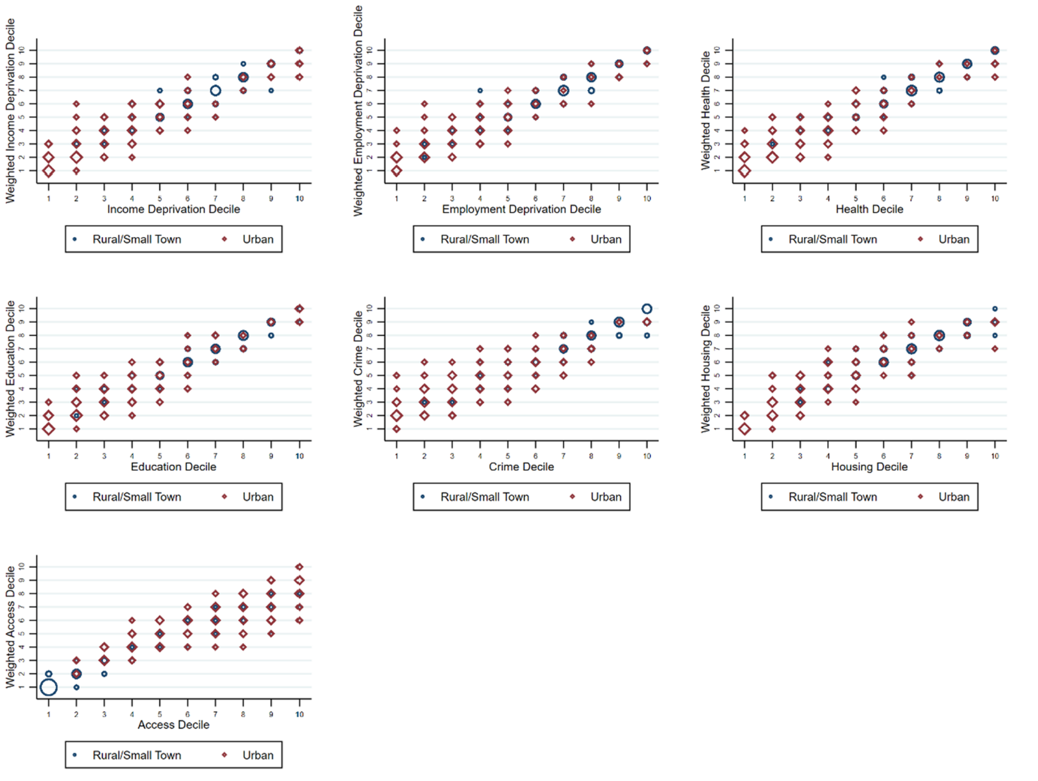

FIGURE 8 School composition—SIMD domain deciles by urban/rural. [Colour figure can be viewed at wileyonlinelibrary.com]

deprived areas (based on SIMD) of Scotland are more homogeneous in the socio-economic classification of their intake than schools in the middle of the SIMD distribution. This suggests that using the approach advocated by Lasselle and Johnson (2021) is likely to capture this dimension of disadvantage relatively well. However, unlike Lasselle and Johnson (2021), we also explore the seven component rankings of the SIMD index. This leads to another contribution of this paper. We find that rural schools are in areas which are mostly deprived in terms of access to services, rather than income, unemployment and education. Not only does this support the hypothesis that SIMD (where the income and employment components are more prominent) is not suitable to capture the many facets of socio-economic disadvantage, but also it suggests some mechanism through which socio-economically disadvantaged pupils in remote areas might do worse than their urban counterparts. For instance, remote areas might face a shortage of childcare facilities, difficulties in hiring good teachers and might lack developed ICT facilities.

Our paper highlights the clear challenges facing rural schools in closing the attainment gap relative to urban schools, reinforcing existing evidence for later stages of schooling. But it is clear that recent developments in the literature also identify improved ways of identifying the rural schools where additional support would be valuable in closing the attainment gap. Despite some limitations of using school-level data, we show that the homogeneity of intake from the most deprived schools makes this a lower-order concern.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

DATA AVAILABILITY STATEMENT

This project uses administrative data that currently cannot be made publicly available. The data were shared with us by the Scottish Government via Data Sharing Agreement No. EDA2001. Research Data Scotland has begun to make the underlying micro data accessible to accredited researcher, see: https://www.researchdata.scot/adr-scotland-data-catalogue. Please contact hub@adruk.org for more information on data access.

ETHICS STATEMENT

This project uses secondary data with anonymised individuals.

ORCID

Gennaro Rossi https://orcid.org/0000-0003-3594-0097

ENDNOTES

[i] See Ilie et al. (2017) for a discussion on the appropriateness of this measure of socio-economic disadvantage.

[ii] According to Sosu and Ellis (2014), children from more affluent areas are about twice as likely as those from deprived areas to do well in school, with inevitable consequences on early school leaving and post-school education. For more details, see www.gov.scot/policies/schools/pupil-attainment/.

[iii] In their work, colleges characterised by high intergenerational mobility were those with a higher share of high-income (top 20% of the income distribution) alumni coming from a low-income family (bottom 20% of the income distribution).

[iv] https://simd.scot/.

[v] These are the income domain rank, employment domain rank, health domain rank, education/skills domain rank, housing domain rank, geographic access domain rank and crime rank.

[vi] For instance, population density is about 3000/km^2 in Glasgow and 9/km^2 in the Highlands.

[vii] These refer to 1st, 4th and 7th primary school grades, respectively. Pupils in Scotland typically enter P1 between the ages of 4.5 and 5.5, unless parents opt for a deferral. In such case, entry age ranges between 5.5 and 6 years old.

[viii] This is a smaller sample size relative to the original sample due to the suppression of observations as part of the required statistical disclosure control.

[ix] We use SIMD 2016, which is © Crown copyright 2016.

[x] These are the income domain rank, employment domain rank, health domain rank, education/skills domain rank, housing domain rank, geographic access domain rank and crime rank.

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APPENDIX A

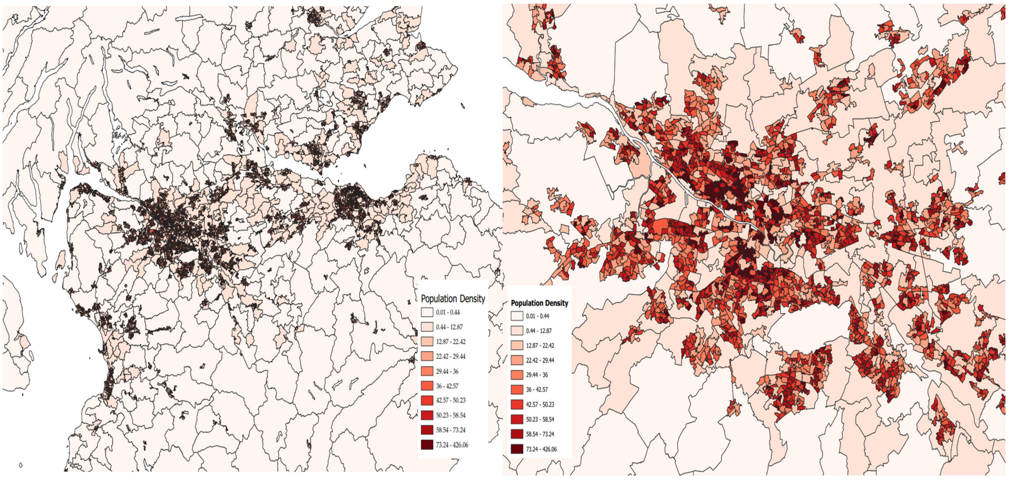

FIGURE A.1 Data zones: Central Belt (left) and Glasgow City (right). [Colour figure can be viewed at wileyonlinelibrary.com]

APPENDIX B

Scottish Government sixfold classification:

1. Large urban areas (settlements with a population greater than 125,000).
2. Other urban (settlements with a population between 10,000 and 124,999).
3. Accessible small towns (settlements with a population between 3000 and 9999 and within 30 min drive of a settlement with a population of 10,000 or more).
4. Remote small town (settlements with a population between 3000 and 9999 and more than 30 min drive from a settlement with a population of 10,000 or more).
5. Accessible rural (areas with a population of less than 3000 and within 30 min drive of a settlement with a population of 10,000 or more).
6. Remote rural (areas with a population of less than 3000 and more than 30 min drive from a settlement with a population of 10,000 or more).

TABLE B.1 Scottish Index of Multiple Deprivation domains.

Income	Income deprivation rate: Percentage of population in receipt of the main forms of means-tested benefits
Employment	Employment deprivation rate: Percentage of working-age population who are not in employment and receive employment or disability-related benefits
Health	Comparative illness factor: Standardised ratio
	Hospital stays related to alcohol misuse: Standardised ratio
	Hospital stays related to drug misuse: Standardised ratio
	Standardised mortality ratio
	Percentage of population being prescribed drugs for anxiety, depression or psychosis
	Percentage of live singleton births of low birth weight
	Emergency stays in hospital: Standardised ratio
Education, skills and training	School pupil attendance
	Attainment of school leavers
	Working-age people with no qualifications: Standardised ratio
	Percentage of people aged 16–19 not in full-time education, employment or training
	Percentage of 17–21-year-olds entering into full-time higher education
Access to services	Average drive time to a petrol station in minutes
	Average drive time to a GP surgery in minutes
	Average drive time to a post office in minutes
	Average drive time to a primary school in minutes
	Average drive time to a secondary school in minutes
	Average drive time to a retail centre in minutes
	Public transport travel time to a GP surgery in minutes
	Public transport travel time to a post office in minutes
	Public transport travel time to a retail centre in minutes
	Percentage of premises without access to superfast broadband
Crime	Crime rate per 10,000 inhabitants
Housing	Percentage of people in households that are overcrowded
	Percentage of people in households without central heating